



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

Industrial Tuna Purse-Seine : Fishing operations

IOTC ROS SFO TR12.4

Category: IOTC fishery: Tuna Purse-Seine Fishery

[IOTC ROS SFO TR12]



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

This module aims to familiarize Observers with tuna purse-seine fishing operations as these will be used daily in their routine work.

Trainee performance is evaluated against the following agreed IOTC ROS competency standards:

- ✓ **Candidate is familiar with common fishing operational scenarios for the industrial tuna purse-seine fisheries.**

The achieving of these standards is demonstrated by candidate capacity to:

- ✓ **Demonstrate knowledge of general procedures in purse-seine fishing operations (searching and fishing).**
- ✓ **Able to identify distinct processing and storing methods used.**



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

TUNA PURSE SEINE FISHING OPERATIONS

Tuna purse-seine fishing operations are divided into two phases:

- 1. The search and detection of tuna schools**
- 2. The fishing event itself (i.e.: the set)**



CapMarine
Capricorn Marine Environmental



1. The Search and Detection of Tuna Schools

by the industrial tuna purse seiners can be either direct or indirect.

- **Direct Search and Detection Methods**

Methods used to directly search for and detect of tuna schools include the use of high-performance binoculars, bird radar, echo sounder, sonars and instrumented buoys attached to artificial and natural DFADs.

- **Indirect Search and Detection Methods**

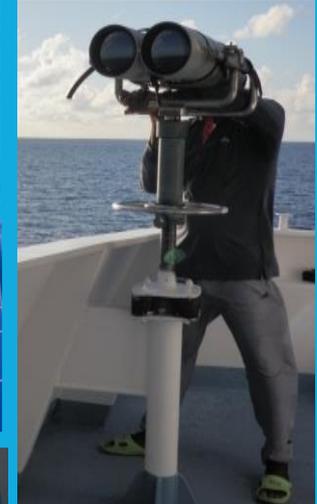
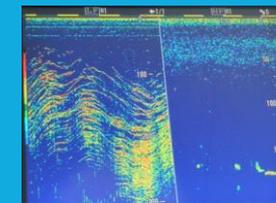
The indirect search for tuna schools involves evaluating a range of environmental parameters and factors that influence the spatial and temporal distribution of tuna and abundance. The combination of these parameter values is used by skippers to decide on the fishing location in order to maximise the chance of finding schools of tuna.





Direct Search and Detection Methods

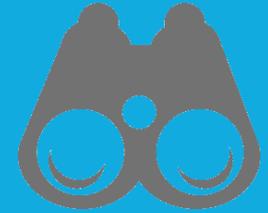
- Binoculars and naked eye
- Sonar
- Sounder
- Bird Radar
- Instrumented satellite buoy
- Speed-boat & Support vessel





HIGH PERFORMANCE BINOCULARS

- Spotters equipped with powerful binoculars (20X) are positioned in the crow's nest to search for indicators of fish in the immediate vicinity of the vessel.
- The search phase is an activity that can occupy the crew for more than 12 hours a day, from sunrise to sunset.



BIRD RADAR

- High frequency and long-range radars that can detect concentrations of feeding seabirds and, in certain conditions, can detect the agitation on the sea surface from feeding fish.



ACOUSTIC SONAR & DEPTH SOUNDERS

- Reserved for fishing.
- Detects shoals of fish in the immediate vicinity of the vessel.
- Also used to assess the school before setting the net, informing the captain of the composition and distribution of the tuna school.



INSTRUMENTED SATELLITE BUOY

- GPS satellite buoy system allows for the position, speed, course and drift of each buoy attached to a DFAD to be received by the vessel.
- Other optional features include the reception of meteorological, oceanographic and sounder data (chlorophyll levels, water temperature up to 150 meters, shear flow in the water column up to 150 meters, and surface wind speed).





Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

Indirect Search and Detection Methods

- Water temperature
- Depth of the thermocline
- Water oxygen content
- Water colour and transparency
- Amount of total suspended matter
- Presence of chlorophyll and macrophytes
- Currents



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

Tuna purse seiners target two types of tuna schools:

- **Associated schools**

(schools of tuna that are associated to a floating object being this natural or man-made)



- **Free-swimming schools**

(schools of tuna that aren't associated to a floating object natural of man-made)



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



iotc ctoi

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

Associated Schools (background)

- Tunas congregates around floating objects. This behaviour is used by tuna purse-seiners to concentrate fish around man made FADs.
- The association of tunas with man-made DFADs is highly advantageous as it aggregates sparsely distributed schools, stabilises them and reduce their speed, making them easier to catch. Consequently, fishing around floating objects is associated with a higher successful haul, or 'set', rate than targeting free swimming schools.
- Sets conducted on associated school have **high bycatch levels and catch small size tuna** including skipjack, juvenile bigeye and yellowfin tuna.



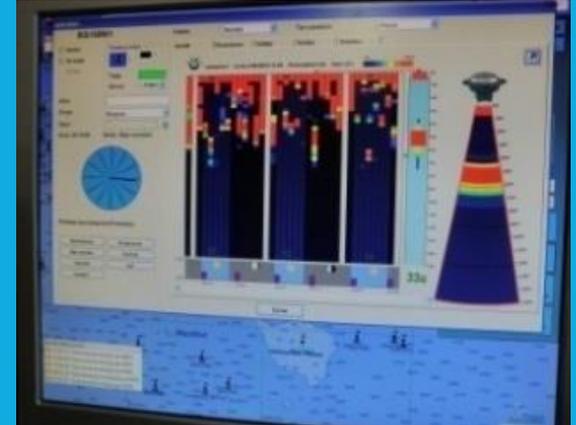


Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

- Both natural and human origin, as well as purpose build FADs can be equipped with instrumented buoys.
- FADs equipped with instrumented buoys:
 - allows fishing opportunities to be focused into a small number of predictable locations
 - can be tracked, which minimises search time and vessel operating costs
 - allows to confirm tuna school presence and size (only for buoys equipped with echo-sounders)
 - by considering information from many active buoys fisherman select the most productive areas to visit.
- Supply vessels allied with one or more purse seine vessels, used to deploy and monitor DFADs further optimising searching efficiency.



CapMarine
Capricorn Marine Environmental



Free-swimming Schools

Free swimming schools of tuna can be detected directly or indirectly. Sets conducted on free-school of tuna tend to give random results. Successful sets are highly profitable since they tend to catch large yellowfin and bigeye and very little bycatch.

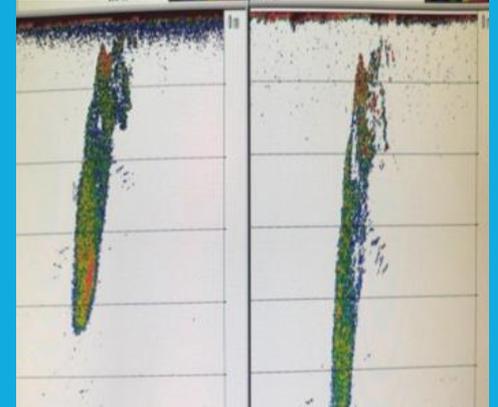
- Indirect detection highly depends on fishing master expertise in the:
 - Use of bird radar
 - Detection of environmental and water physio-chemical parameters (weather forecasts, water temperature & thermocline, oxygenation, current and suspended matter)
- The direct detection depend on vessel watchers and bridge officers skills to identify groups of birds, surface currents, fish jumping, sea-mammals and any other fish school sign, using binoculars, naked eye, sonar, depth sounder, and communication with other boats.

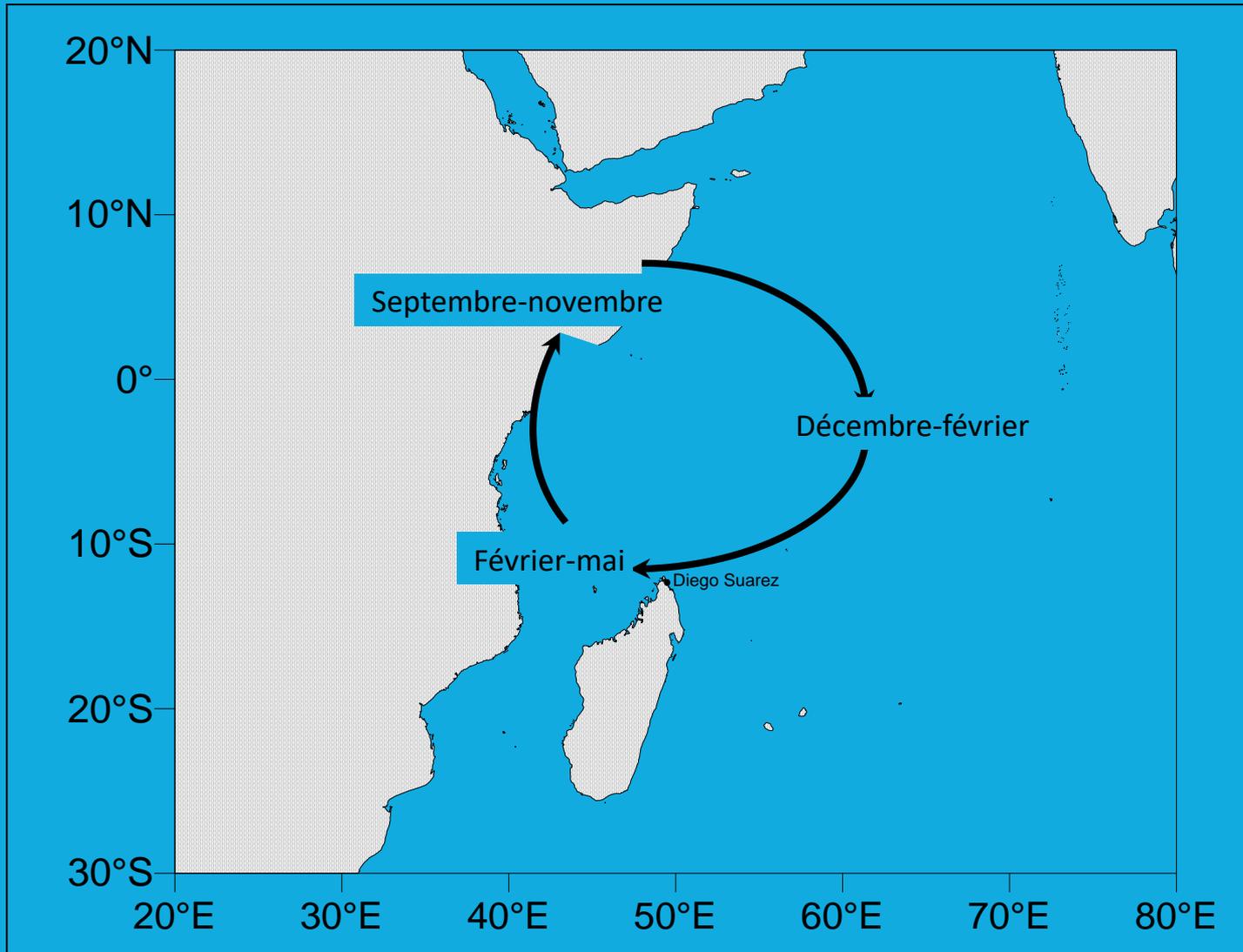




Vocabulary Used When Sighting a Tuna School

- ❑ Balbaya : sea surface covered in ripples indicating the presence of tunas just under the surface
- ❑ Sardara : sea surface severely disturbed by the tuna school, splashes & jumps visible
- ❑ Gleurre (carnada in Spanish) : strong aggregation of various organisms (potential tuna prey), often found around a floating object. Appears like a red ball on the sonar / sounder.







Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

FISHING EVENT: DEPLOYMENT AND RETRIEVAL OF THE PURSE SEINE NET [“SET” OR “EVENT”]



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

- Tuna purse-seining involves surrounding a tuna school with a net, impounding the fish by pursing the net, and drawing up the catch by hauling the net so that the fish are crowded into the bunt of the net and can then be brailed out of the water using a brailer and emptied into a chute on the deck leading down to the well-deck where they are channelled into the brine tanks for freezing.
- A “set” or “event” starts when the net is deployed and ends when the net is hauled back onto the deck.
- This is an intensive activity taking no more than a few hours depending on the quantity of fish caught.



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

This is an intensive activity taking no more than a few hours depending on the quantity of fish caught.

There are a few distinct passes in a single fishing event:

- setting the net (shooting)
- circling the school of fish
- pursing the net
- hauling back the net and
- brailing out the fish



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations

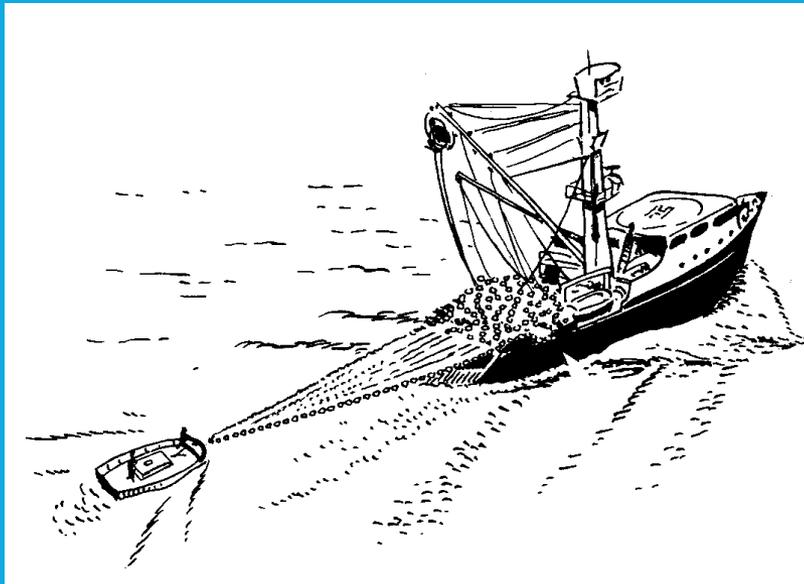


Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

SHOOTING

Start of the set marked by the deployment of the skiff with the end of the seine attached to its rear.



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

1. Once the presence of a tuna school is confirmed by the sonar, the fishing vessel circles until its port side is facing the school (most of the tuna purse seiners have deck arrangement for operating from the port side).
2. At the release signal ordered by the skipper, the skiff is deployed with the end of the seine attached to its rear.



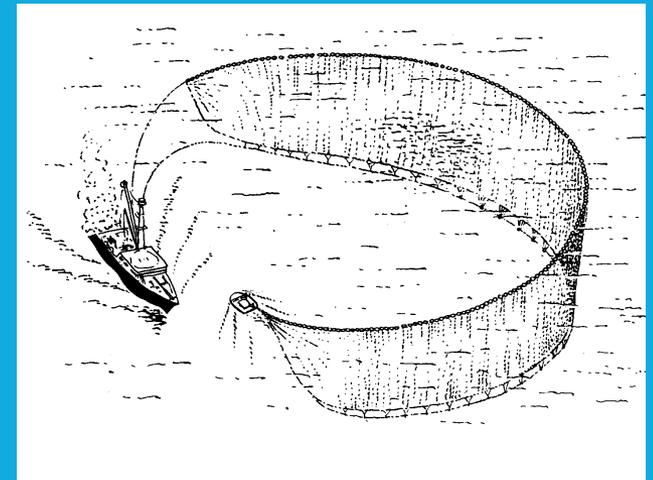
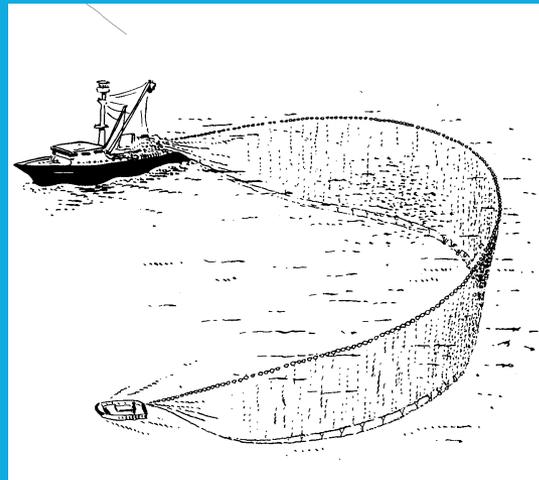
CapMarine
Capricorn Marine Environmental



CIRCLING

The skiff is used to hold the net during the encircling of the school. He serves as a fixed point while the purse-seiner encircles the school at maximum speed.

This action lasts between 4 to 8 minutes.





Food and Agriculture
Organization of the
United Nations



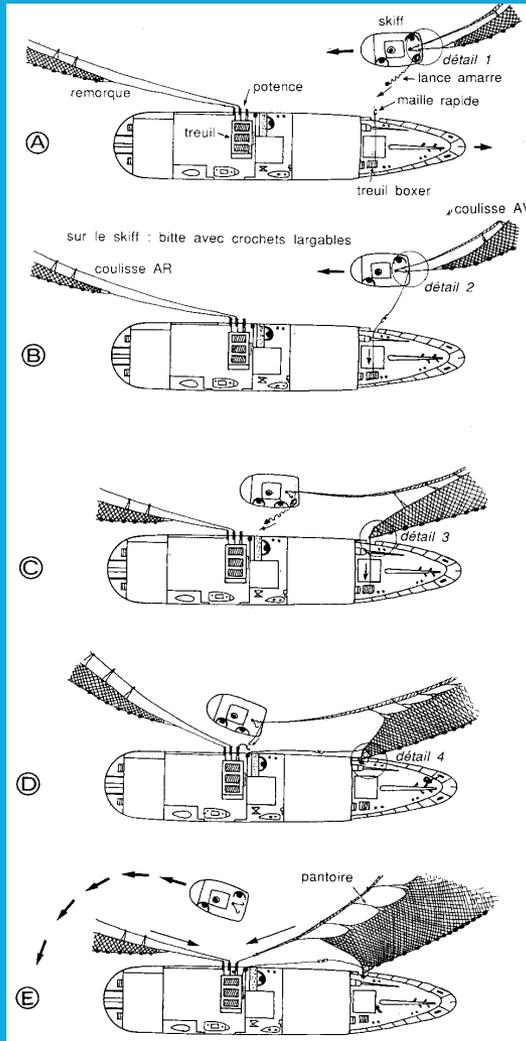
Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

- When fishing on FADs, a speed vessel is frequently placed inside the circle formed by the net, next to the FAD to keep the tuna school on an optimum position so that it does not escape.
- When fishing for a free school, the speed vessel keeps the school of fish grouped by circumventing.
- Vessels use the - speed-boat and fluorescein tint to avoid the escaping of the tuna school while circling and pursuing it.





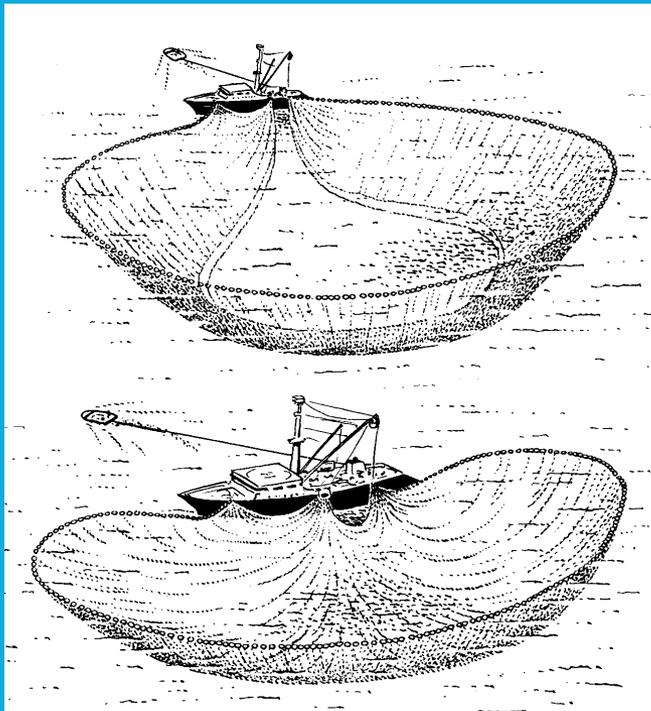
Once the fish encircled, the skiff finishes the loop, then passes each of the cables to the purse seiner, which starts to close (purse) the net.



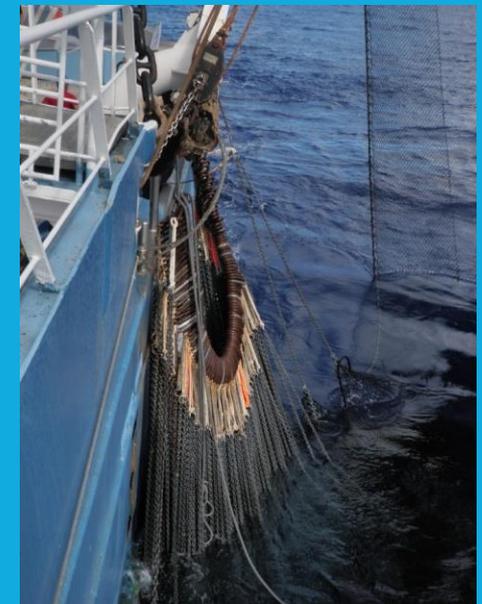


Pursing

The two ends of the purse line cable are hauled in with the winch as rapidly as possible to close the bottom of the net.



Pursing may take up to 15 or 20 minutes



Pursing ends when
the pursing rings are
on board





Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

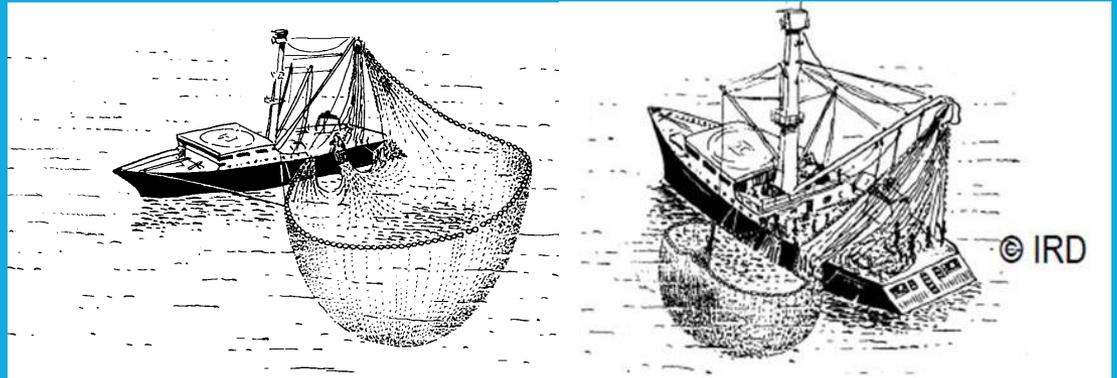
iotc ctoi

Hauling

The net is hauled (pulled aboard) using the power block attached to the end of a boom above the deck. The net is hauled until the fish is concentrated into the bunt or chaffer of the net.

The net forms a pocket at port-side.

Duration: 1 h



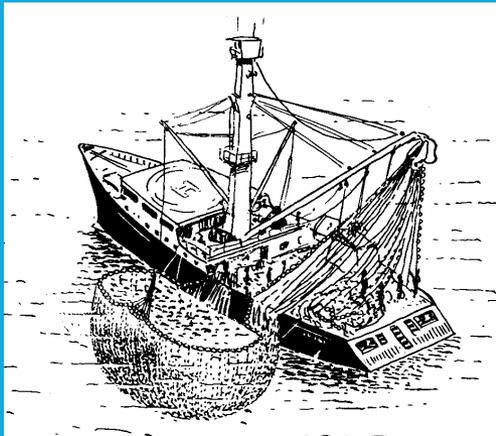
CapMarine
Capricorn Marine Environmental



Brailing

When most of the purse seine has been retrieved, and the tuna are concentrated within the bunt on the portside of the vessel. The fish are scooped out using a large scoop-net called the "brailer".

- Scoop capacity: up to 10 tonnes (depending on fish size)
- Brailing duration depends on fish quantity (1/2 h)
- Fish emptied into a chute on the main deck and channelled to the fish-wells below.





Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

The crew conducts a first on-site. Rejections are returned to the sea using the rejection conveyer belt or are grouped in bins or nets and discharged at the end of sorting. Sorted fish is placed into brine (refrigerated sea water) tanks at -2° before being frozen at -15°





Shifting

Some ships sell fish for fillets and for "sashimi" tuna. This practice requires additional manipulation called "shifting".

- ❑ Passage from a brine tank (-17 ° C) to a dry well (-40 ° C)
- ❑ Can take place during the day or the evening during which a second sorting takes place.
- ❑ As the 2nd sorting takes place:
 - Rejection of non commercial spp
 - Separation of the catch by spp and size (adult YFT and BET)



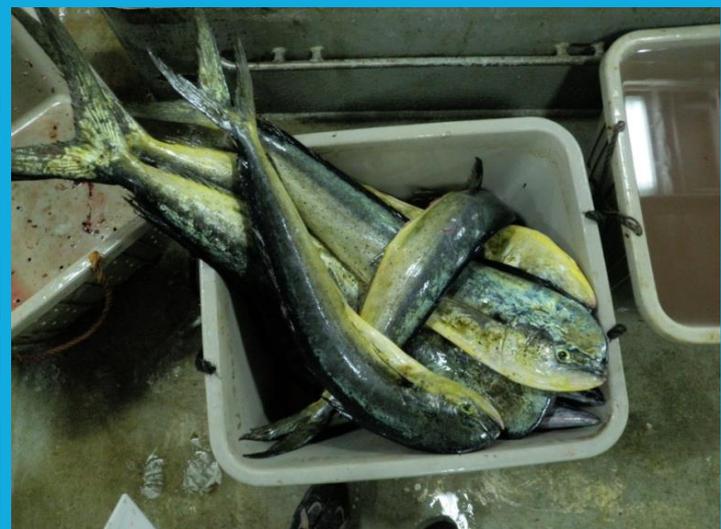


Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi



CapMarine
Capricorn Marine Environmental



Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

Unloading



- On land to the cannery or cold storage facilities
- To containers
- To freezer cargos





Food and Agriculture
Organization of the
United Nations



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

ANY QUESTIONS?



send us a message via Talents LMS



CapMarine
Capricorn Marine Environmental